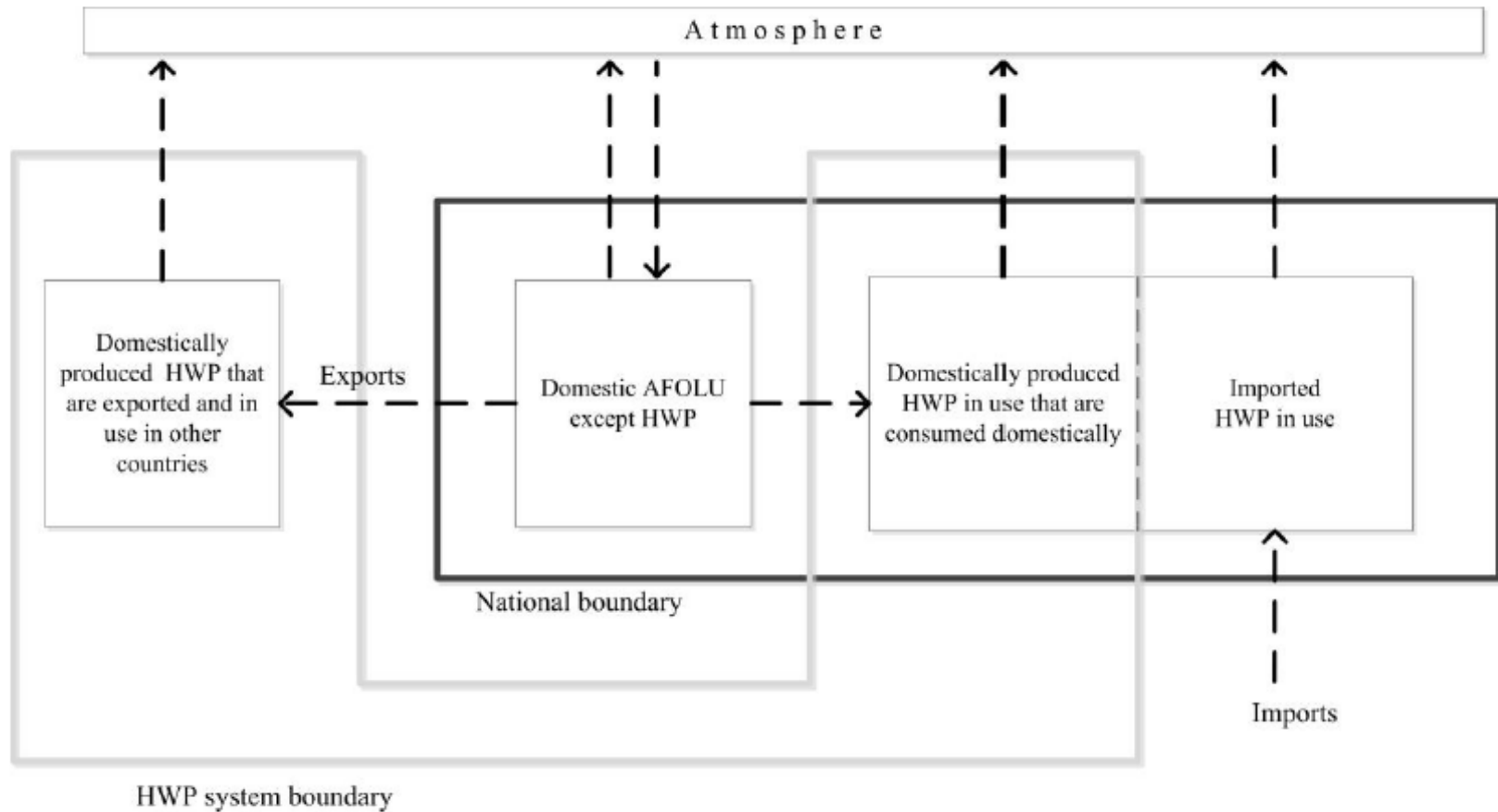


Harvested Wood Products Assessment for WA : Preliminary Results

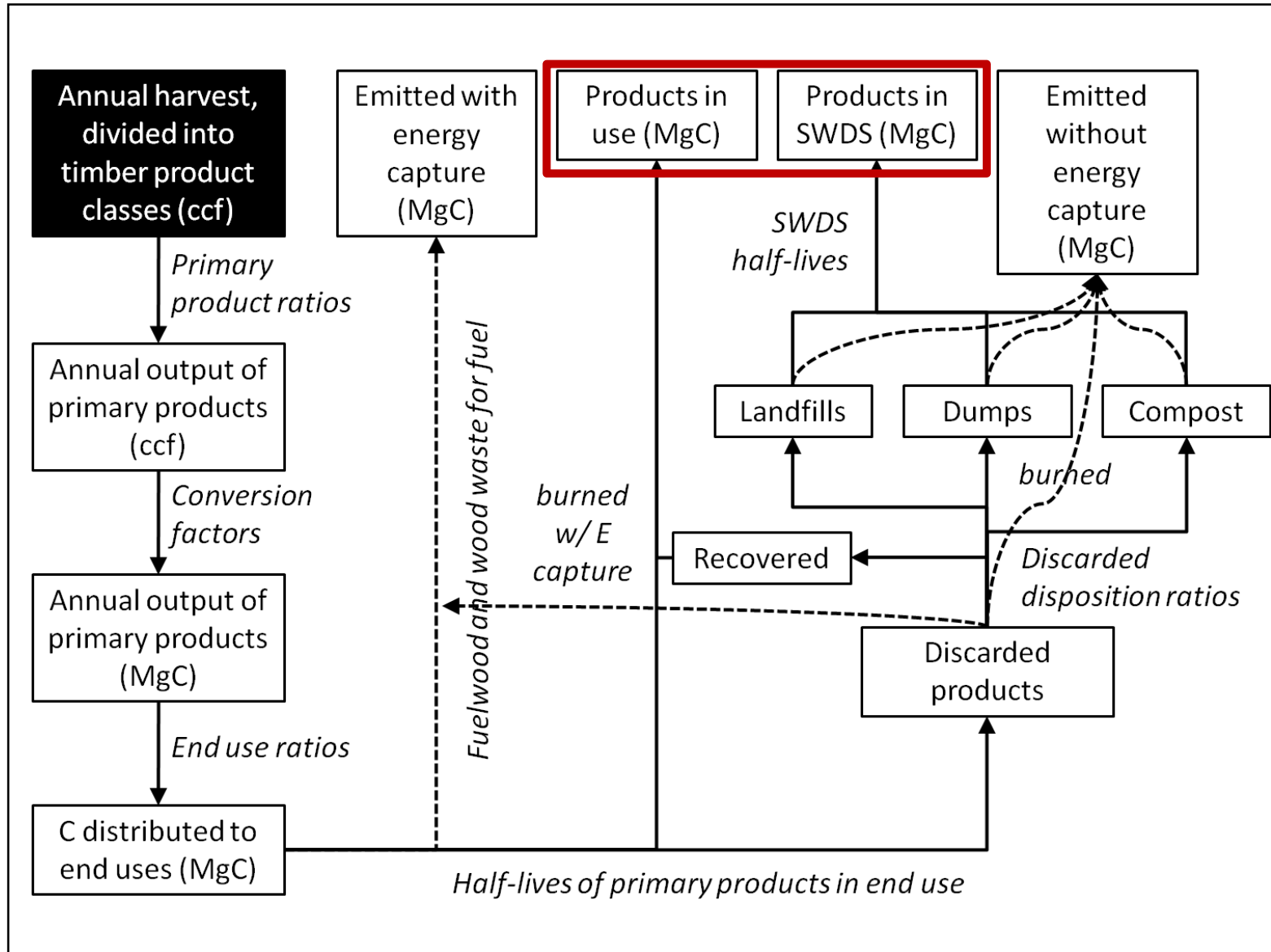
Grant Domke, Nate Anderson, Todd
Morgan, Mike Nichols, and Glenn
Christensen

WA CSAG Meeting – July 9, 2020

Production Approach



Calculations



The model(s)

[Home](#) [About](#) [Advanced](#) [Contact](#)

Harvested Wood Products

Configure a simulation.

Download an Excel macro-enabled workbook that will help create the input data files [here](#). Use the HWP Ribbon to export data in the correct format for this tool or to add a new year. Do NOT change the basic format of any of the worksheets.

Steps:

1 Upload yearly harvest data

No file chosen

2 Upload yearly timber product ratios

No file chosen

3 Upload yearly primary product ratios or choose region for default ratios

See a map of the regions [here](#).

or No file chosen

4 Upload distribution parameters (optional and rarely used)

No file chosen

5 Upload ratios for burned with energy capture (optional and rarely used)

No file chosen

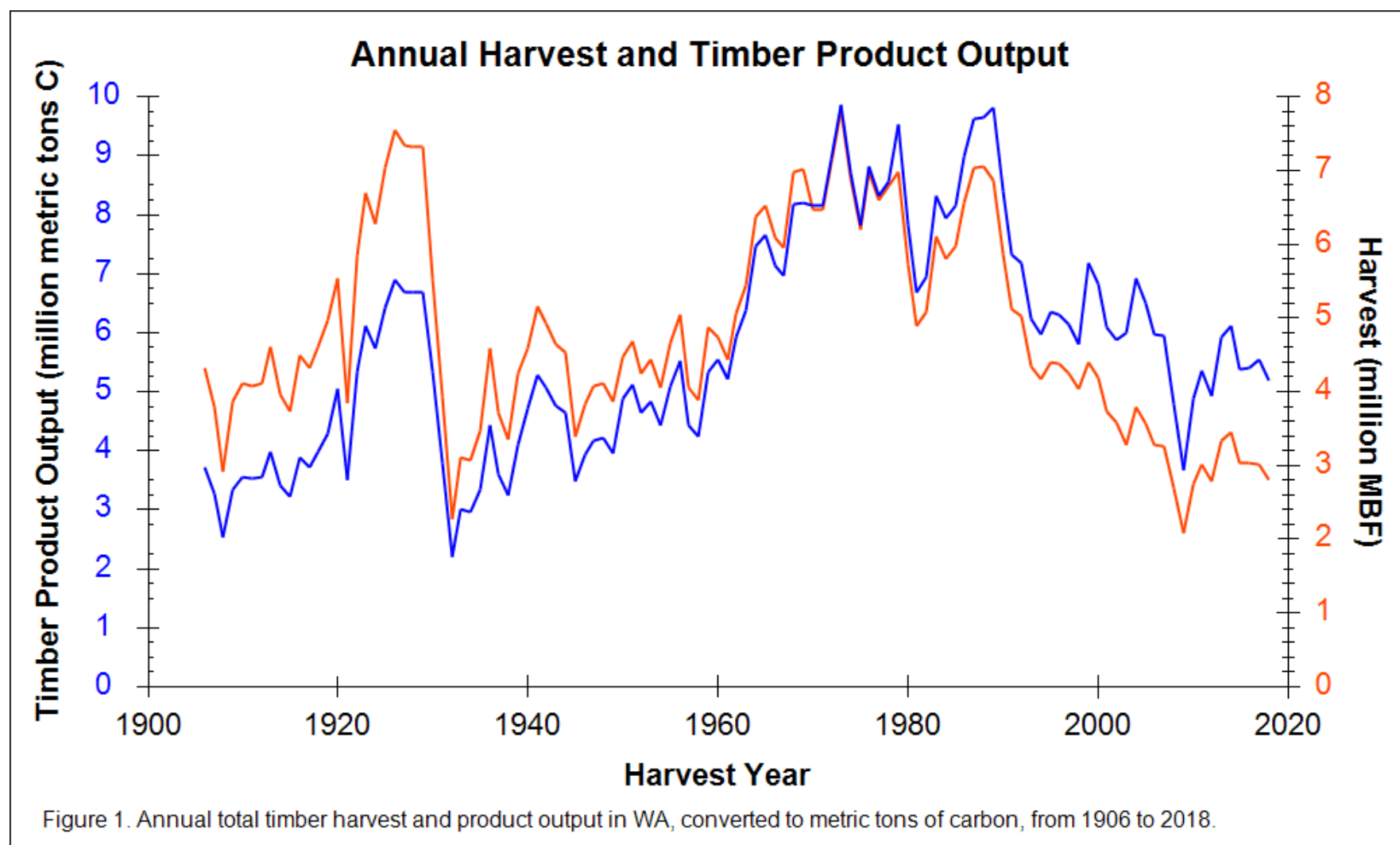
6 Enter number of iterations

Any number larger than 1 will result in Monte Carlo simulation and the only output will be a table of confidence intervals around carbon storage for each year.

Address to send email when done with Monte Carlo:

7 Run the model

DRAFT – DO NOT CITE



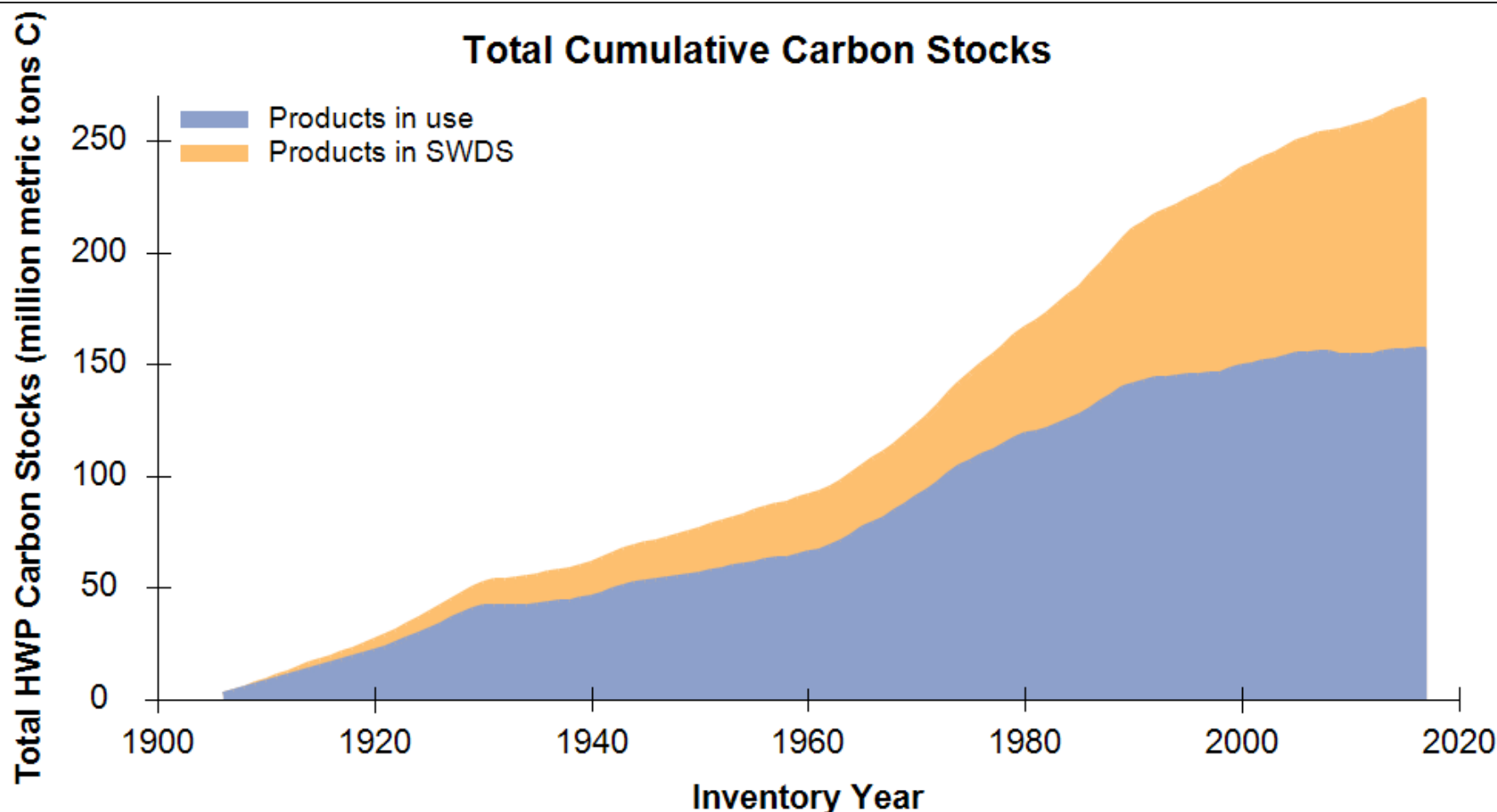


Figure 2. Total cumulative metric tons of carbon stocks in harvested wood products (HWP) manufactured from total timber harvested in WA from 1906 to 2018 using the IPCC Tier 3 Production Approach. Carbon in HWP includes both products that are still in use and carbon stored at solid waste disposal sites (SWDS).

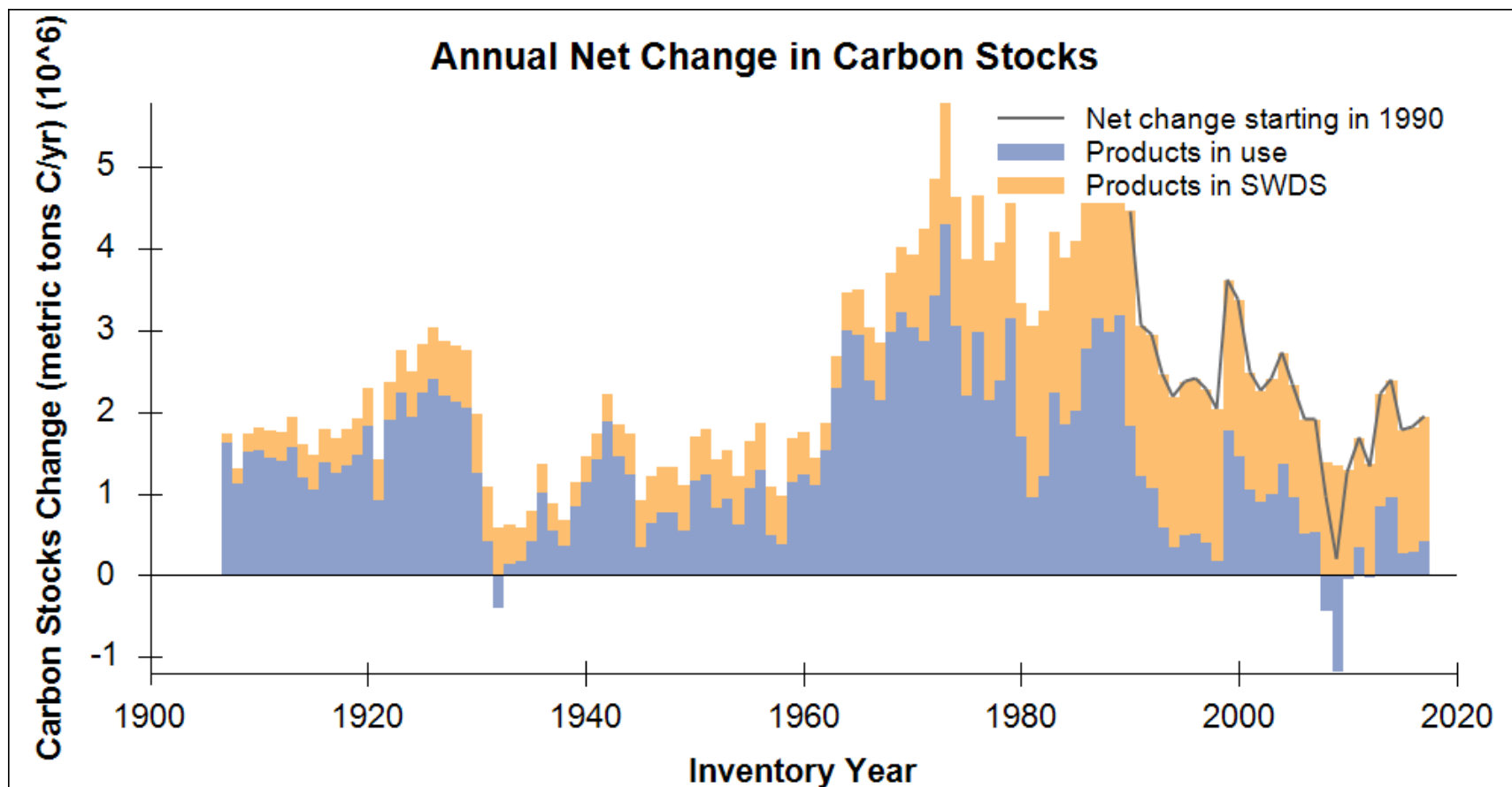
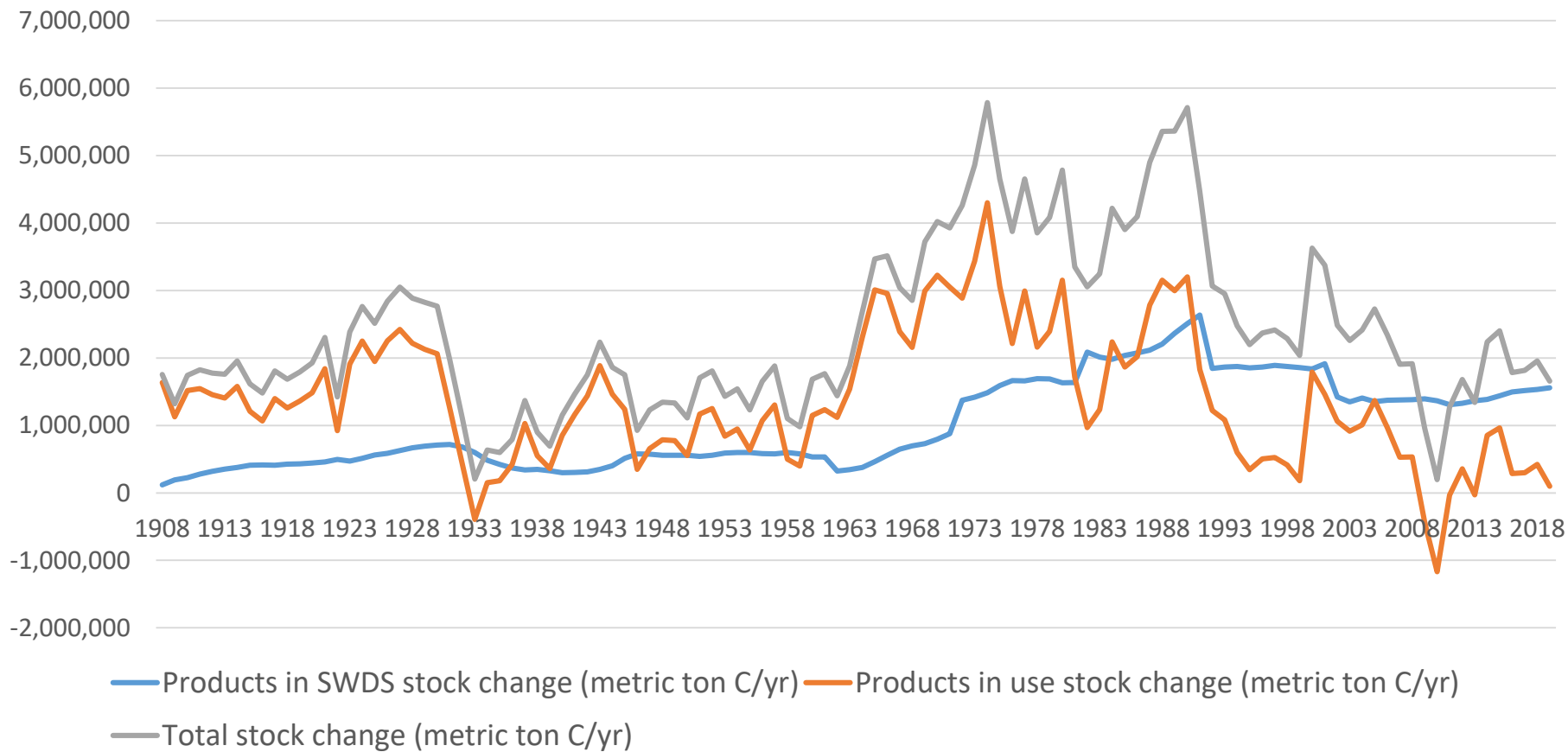


Figure 3. The annual net change in total WA harvested wood products carbon stocks, in metric tons, from 1906 to 2018. The gray line displays the net change in carbon stocks, which is the sum of solid waste disposal sites (SWDS - orange bar) and products in use (blue bar). The orange and blue bars represent the stock change from the previous year; negative values indicate that the carbon in the pools are shrinking, while positive values indicate that the pools are growing.

Annual Net Change in Carbon Stocks



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Washington Total Carbon Stocks on Forest Land by Pool: 2007-2016

		<i>Million metric tons C</i>	
Carbon Pool		Total	SE
Live trees			
Aboveground		902	10.50
Belowground		182	2.19
Dead trees			
Aboveground		80	2.02
Belowground		22	0.53
Understory vegetation			
Aboveground		25	0.16
Belowground		3	0.02
Down wood		150	2.33
Forest Floor		129	0.85
Soil		1,225	6.87
Total Carbon		2,718	18.47
Harvested wood products		257	0.06
	Products in use	155	
	SWDS	103	

Forest ecosystem data from Glenn Christensen, US Forest Service.

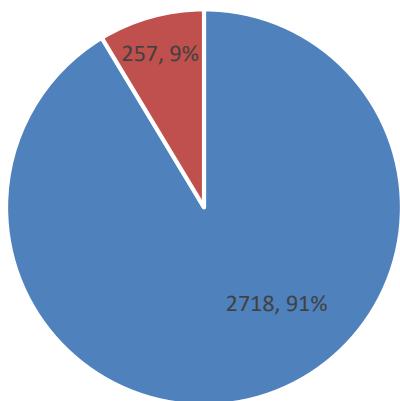
Harvested wood data from initial run of model (June 11, 2020) using a carbon accounting model based on the IPCC Tier-3 production approach developed by the US Forest Service, the University of Montana, the California Department of Forestry and Fire Protection, and Utah State University.

Washington Annual Carbon Flux (CO₂e) on Forest Land by Pool, All Ownerships: 2002-2006 to 2012-2016

Change in Carbon Pool (thousand metric tons CO2 equivalent per year)			
		Total	SE
Standing Live tree			
	Mortality	-32,872	1,250
	Cut	-31,214	2,735
	Gross Growth	78,389	1,247
	Net	14,303	3,283
Foliage		833	195
Tree Roots			
	Live	3,112	746
	Dead	641	227
Standing Dead		4,082	910
Dead Woody Debris		-6,846	1,184
Understory Vegetation			
	Above Ground	-58	38
	Below Ground	-6	4
Total		16,060	4,274
Forest Floor		250	206
Soils		-175	301
Total (including soils and forest floor)		16,135	4,396
Harvested wood products		6,080	1
	Products in use	1,060	
	Solid waste disposal sites	5,020	

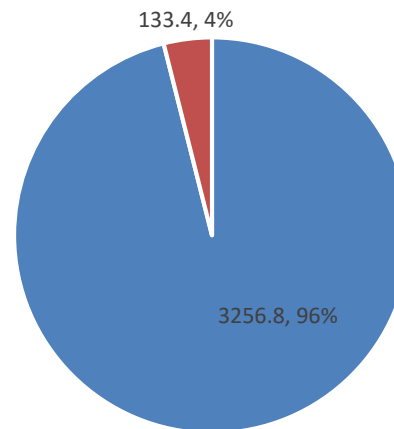
Forest ecosystem data from Glenn Christensen, US Forest Service. Harvested wood data from initial run of model (June 11, 2020) using a carbon accounting model based on the IPCC Tier-3 production approach developed by the US Forest Service, the University of Montana, the California Department of Forestry and Fire Protection, and Utah State University.

WA Stock (MMT C)



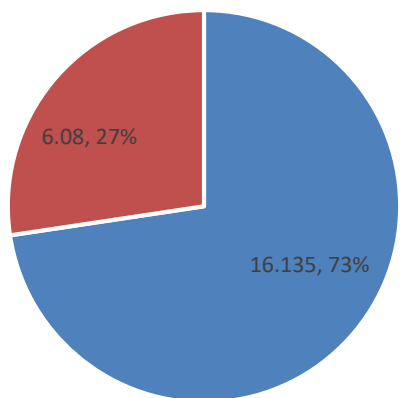
■ Forest ecosystem ■ HWP

CA Stock (MMT C)



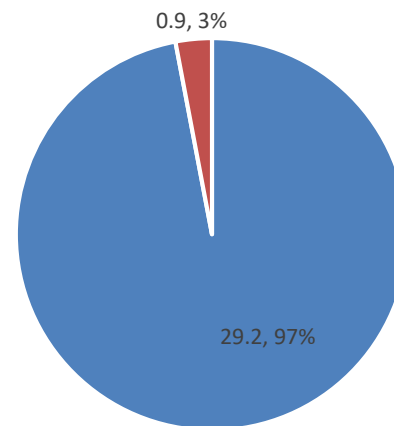
■ Forest ecosystem ■ HWP

WA Flux (MMT CO₂e)



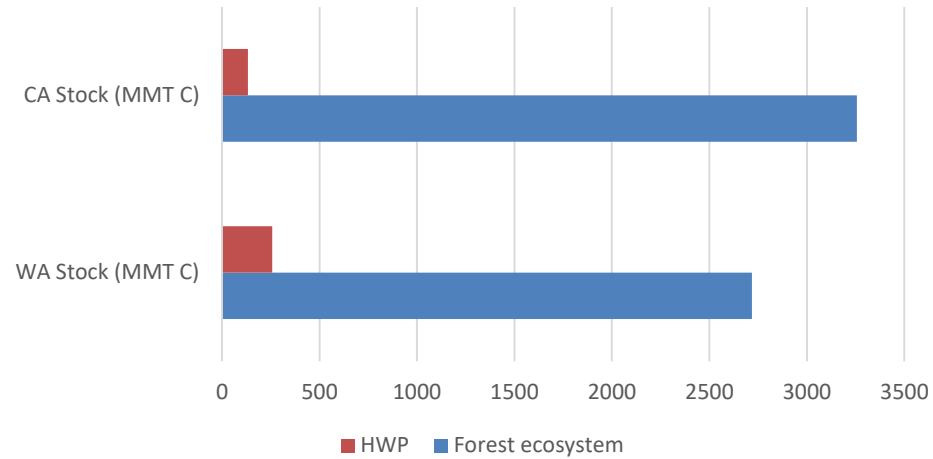
■ Forest ecosystem ■ HWP

CA Flux (MMT CO₂e)

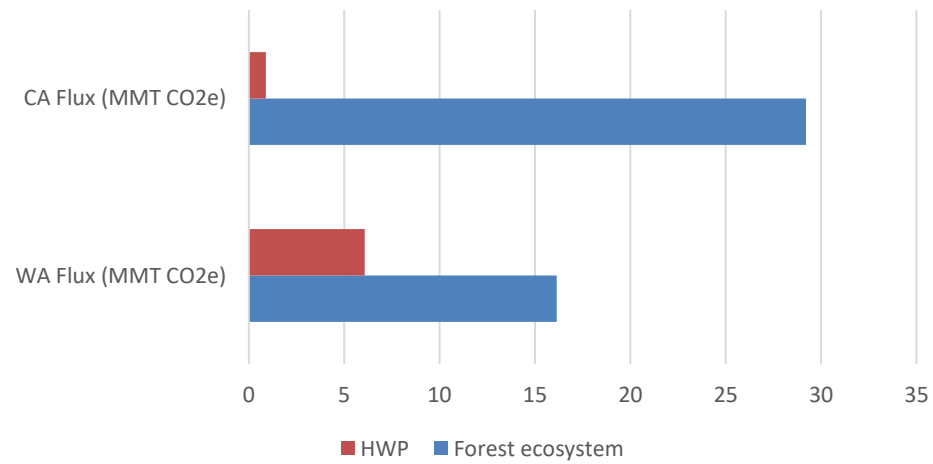


■ Forest ecosystem ■ HWP

WA vs CA Stock



WA vs CA Flux



Live Tree Annual Carbon Flux (CO₂e), All Ownerships: 2002-2006 to 2012-2016

CARBON POOL	Statewide Forest CO₂e Flux			
	Total	SE	Total	SE
	<i>million metric tons CO₂e per year</i>	<i>million metric tons CO₂e per year</i>	<i>metric tons CO₂e per acre per year</i>	<i>metric tons CO₂e per acre per year</i>
Standing live trees¹				
Mortality	-32.9	1.2	-1.49	0.06
Removals	-31.2	2.7	-1.42	0.12
Gross growth	78.4	1.2	3.56	0.05
Net Live Tree Flux	14.3	3.3	0.65	0.15

¹excluding live tree foliage

Live Tree Mortality Carbon Flux (CO₂e) by Cause, All Ownerships: 2002-2006 to 2012-2016

LIVE TREE MORTALITY ATTRIBUTION	Statewide Live Tree Mortality CO₂e Flux			
	Total	SE	Total	SE
	<i>million metric tons CO₂e per year</i>		<i>metric tons CO₂e per acre per year</i>	
Fire killed	-4.9	0.7	-0.22	0.03
Cut and fire ¹	-0.1	<0.1	-0.00	0.00
Insects and disease	-9.3	0.9	-0.42	0.04
Natural and other causes	-18.5	0.8	0.84	0.04
Net Mortality Change	-32.9	1.2	-1.49	0.06

¹plots where mortality has occurred due to both harvest and fire

Live Tree Cut Carbon Flux (CO₂e) by Cause, All Ownerships: 2002-2006 to 2012-2016

Of the 31.2 MMT CO₂e/yr forest ecosystem cut:

- Cut (harvested) 95.5%
- Cut & Fire* 0.6%
- Fire killed 0.1%
- Insects & Disease 0.5%
- Other cut & weather 0.7%
- Undisturbed** 2.6%

* Cut & Fire: Unknown if tree was harvested before or after fire impacted inventory plot.

**Undisturbed includes small disturbance on plot (<25% of plot area impacted).

Live Tree Cut Carbon Flux (CO₂e) - How FIA measures and estimates annual harvest flux

- FIA tracks live trees based on status at time 1.
 - At time 2, remeasured trees are 1 of 3 present status codes: live, dead (mortality), or removed (harvest).
- FIA field protocol defines a removed tree as, “A tree that has been cut or removed by direct human activity related to harvesting, silvicultural activity or land clearing.”
 - Includes trees physically removed and trees cut during treatment activity (thinning) but not removed (downed wood pool)
 - Year of tree harvest is estimated but isn’t accounted for when estimating total CO₂e removals.
- FIA CO₂e estimate based on calculation of whole-tree biomass, the sum of tree bole (stump to min. log diameter), top and branches, and bark.
 - Live tree roots and foliage are tracked in separate carbon pools.

'Cut' relation to HWP input

- Forest Cut: 31.2 MMT CO₂e (Source: FIA analysis, presented mtg #1)
- Timber Product Output (TPO): 21.6 MMT CO₂e (Source: DNR Mill Survey)
- HWP flux: 6.1 MMT CO₂e (Source: this HWP analysis, using TPO as an input)
- Here's the difference and relationship between these:
 - FIA estimate based only on remeasured live trees, any harvest activity if removed or not, doesn't account for actual year of harvest, based on estimated whole-tree biomass.
 - Timber Product Output includes the portion of felled trees which are designated for milling or direct consumption, such as sawtimber, pulpwood, fuelwood, poles, mine props, pilings, float logs, etc.
 - HWP (Harvested wood products) includes that portion of timber products which are currently in use (either from the current or a previous year's harvest) and those which are discarded and stored in solid waste disposal sites (SWDS).

Interpretation – HWP

- For a given year, HWP stocks are made up of wood materials in SWDS and wood products currently in use.
- SWDS stocks are relatively constant over time – they are equal to previous year's stock minus decomposition plus new discards
- Products in use stocks vary with the economy – mainly a function of harvest amounts
- HWP flux for a particular year tends to be equivalent to one-fourth to one-third of timber product output for that year; the current national average ratio is 24%, while this study indicated a ratio of 28% for the state of WA over the ten-year period of 2002-2016.

Thank you

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Glenn Christensen: glenn.christensen@usda.gov

FIA program: www.fia.fs.fed.us

FIA carbon: <http://www.fia.fs.fed.us/forestcarbon/>

Guidance from Incubator Team

- Provide 101-level interpretation of the meaning of the HWP numbers
- Place HWP results and forest ecosystem results together for context
- Provide additional explanation of forest ecosystem mortality
- Provide additional explanation of how removals are connected to the input for HWP results

Timber Products vs. Primary Products

Timber Products:

Categories recorded at time of timber sale or harvest, may not closely correspond to primary products manufactured.

Examples: sawtimber, pulpwood, fuelwood, non-saw, misc-convertible products.

Primary Products:

Categories of 1st products manufactured from the timber, includes mill residue uses.

Examples: lumber, plywood, woodpulp, non-structural panels.

Timber Product Ratios

- The model has 40 timber product classes, 20 classes each for softwood and hardwood
- Annual time series; ratios sum to 1.00
- Examples of timber product classes include:
 - Hardwood sawtimber, softwood sawtimber, softwood poles, hardwood poles, hardwood pulpwood, softwood pulpwood, mine props, ties, float logs, miscellaneous convertible

Primary Product Ratios

- Annual volumes of harvested timber products (e.g. softwood sawtimber) distributed to primary products
- The model has 64 primary product classes
- Examples of primary product classes include:
 - Softwood lumber, softwood poles, hardwood wood pulp, softwood wood pulp
- Example of a timber product distributed to primary products:

